Original Article

A study on correlation between bacterial isolates from blood and CRP values in sepsis patients in a tertiary care hospital

Dr Madhura CM[1], Dr Lavanya J[2], Miss Sreelakshmi Balachandran[3], Miss Saranya T[4]

[1] Assistant Professor, Department of Microbiology, Chikkamagaluru Institute of Medical Sciences, Chikkamagaluru, Karnataka, India.
[2] Associate Professor, Department of Microbiology, Chikkamagaluru Institute of Medical Sciences, Chikkamagaluru, Karnataka, India.
[3,4] Tutor, Department of Microbiology, Chikkamagaluru Institute of Medical Sciences, Chikkamagaluru, Karnataka, India.

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Corresponding Author:

Dr Madhura CM

Assistant Professor, Department of Microbiology, Chikkamagaluru Institute of Medical Sciences, Chikkamagaluru, Karnataka, India.

ABSTRACT

Background: Sepsis is one of the main causes of death in critically ill patients, which is acknowledged as a systemic inflammatory response syndrome (SIRS) brought on by infection.

C-reactive protein (CRP), an acute-phase reactant released by the liver during inflammation has unique reaction to infection as it can raise very high (often >1000 times), unlike in any other inflammatory disease.

Materials and methods: A retrospective study was conducted in the Department of Microbiology , Chikkamagaluru Institute of Medical Sciences , Chikkamagaluru for a period of one year from November 2024 to October 2025.

Blood samples were collected from suspected sepsis cases for conventional culture in BHI broth and processed according to the standard Microbiological and CLSI guidelines. Pathogens grown were subjected to identification by biochemical reactions and antibiotic sensitivity test by Kirby -Bauer disc diffusion method. CRP values in serum were detected by automated method.

Results: In one year from November 2024 to October 2025, 743 blood samples were received to the laboratory, 352 were males and 391 were females and 633 samples belongs to patient less than 10years and 110 samples belongs to more than 10 years , out of which 93 samples had growth. Among pathogens Klebsiella spp (31) , Staphylococcus aureus (30) were majority followed by E coli (14), Pseudomonas spp (11). We also isolated Gram negative non fermenters (3) , Streptococcus (2) , Acinetobacter (1) and Enterococcus (1) . None of the isolated pathogens were MRSA or ESBL/MBLs.

Among the pathogens 10 Staphylococcus aureus , 1 Streptococcus , 5 E coli , 3 Klebsiella spp , 1 Pseudomonas spp had CRP values more than 5mg/L and Staphylococcus aureus has high CRP value of 76.6mg/L, followed by Pseudomonas spp of 65.4, E coli of 61.5, Klebsiella spp of 43.3, Streptococcus 16.1mg/L.

Conclusion:This study provides baseline data on the correlation between blood pathogens and CRP values in sepsis patients. Gram-positive organisms are more in number and with high value of C-reactive protein (CRP) when compared to Gram-negative organisms.

Incorporating CRP measurements into the initial evaluation of patients with suspected sepsis may help identify those at greater risk of complications.

Keywords: *CRP, sepsis, Gram positive organisms, Gram negative organisms.*

INTRODUCTION

One of the main causes of death for critically ill patients is sepsis, which is acknowledged as a systemic inflammatory response syndrome (SIRS) brought on by infection. With 18 million new cases annually and a death rate of up to 30%, sepsis continues to be a significant challenge despite advancements in medical technology[1].

C-reactive protein (CRP), an acute-phase reactant released by the liver during inflammation has unique reaction to infection is that it can raise very high (often >1000 times), unlike in any other inflammatory disease [1].

To initiate adequate antibiotic treatment in sepsis, timely understanding of whether the cause of systemic infection is gram-negative (Gram−) or gram-positive (Gram+) bacteria in origin would be important for doctors. Gram+ bacterial infections have far higher serum C-reactive protein (CRP) levels than gram− infections[4].

CRP is thought to be the most sensitive acute-phase protein in the detection of bacterial infections due to its low basal concentration, quick and effective production increase following the stimulus, and brief half-life[4].

MATERIALS AND METHODS
A retrospective study was conducted in the Department of Microbiology , Chikkamagaluru Institute of Medical Sciences , Chikkamagaluru for a period of one year from November 2024 to October 2025.

Blood samples collected from suspected sepsis cases admitted in hospitals attached to CIMS were sent to Department of Microbiology, CIMS for conventional culture in BHI broth.

The specimens were inoculated on MacConkey and blood agar and after incubating at 37°C aerobically for 48 hours examined for growth, if there is no growth streaking was continued on alternate days for upto 1week. Pure isolated colonies of pathogens grown were processed according to standard Microbiological[2] and CLSI guidelines[3]. Identification of organisms was done by conventional biochemical reactions and antibiotic sensitivity test was done by Kirby -Bauer Disc Diffusion method.
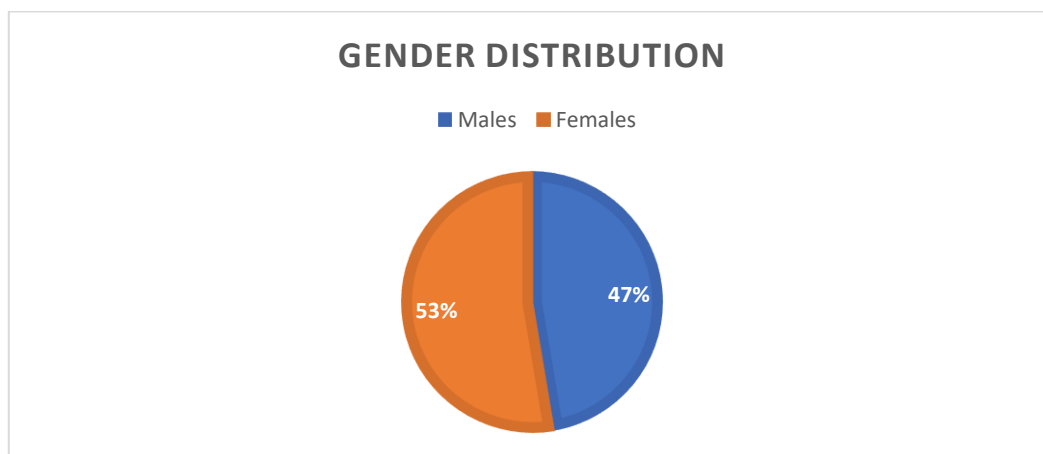
Statistical Analysis: The data collected was entered into excel sheet. Demographic profile, distribution of different bacterial isolates was analysed, CRP values were correlated with isolated bacteria.
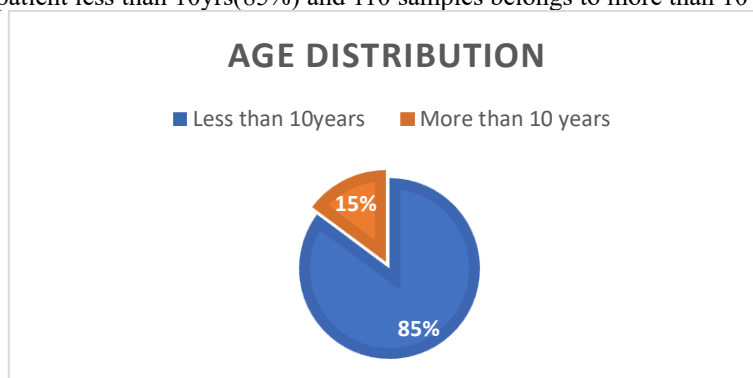
RESULTS
In one year from November 2024 to October 2025, 743 blood samples were received to the laboratory out of which 93 samples had growth.
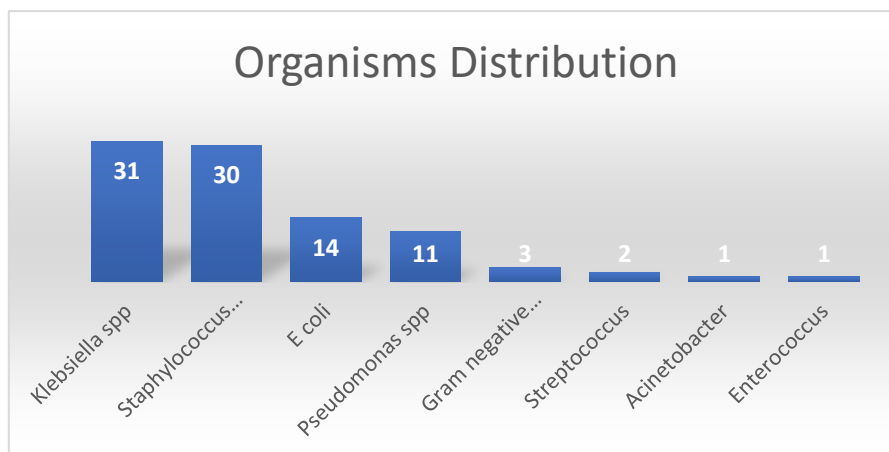
Demographic profile
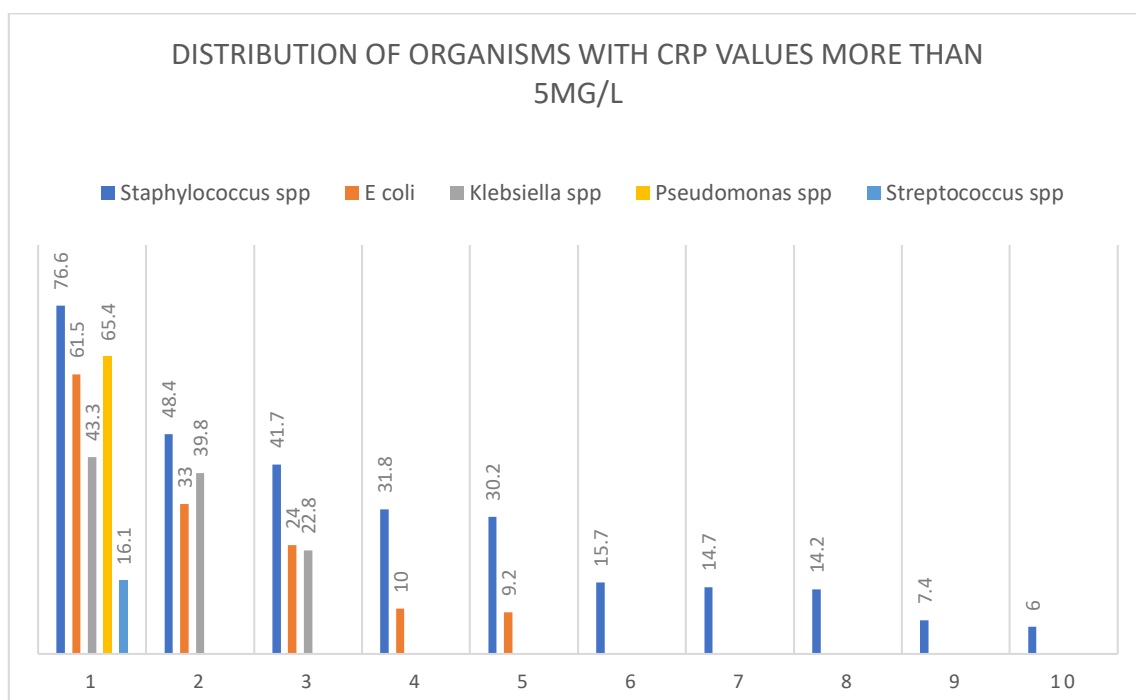352(47%) were males and 391(53%) were females.

GENDER DISTRIBUTION

633 samples belongs to patient less than 10yrs(85%) and 110 samples belongs to more than 10 yrs(15%).
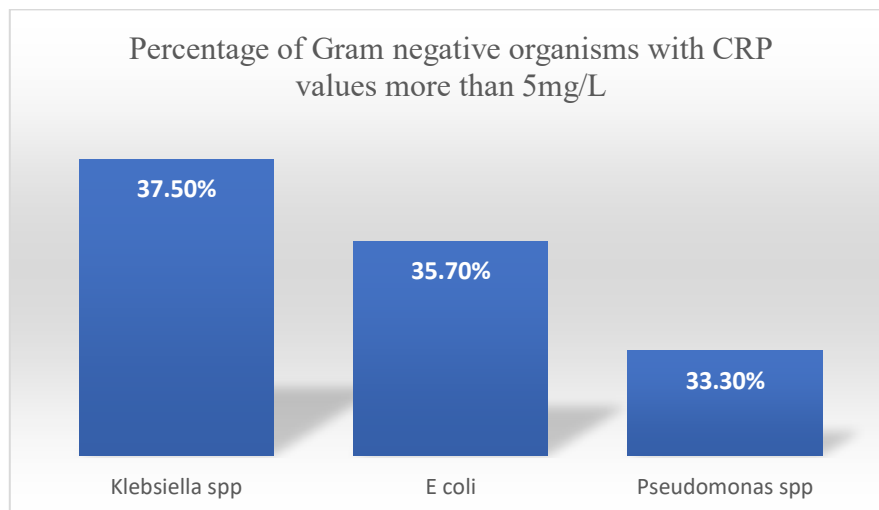

AGE DISTRIBUTION

Among pathogens *Klebsiella spp* (31) , *Staphylococcus aureus* (30) were majority followed by *E coli* (14), *Pseudomonas spp* (11) were isolated. We also isolated *Gram negative non fermenters* (3) , *Streptococcus* (2) , *Acinetobacter* (1) and *Enterococcus* (1) . None of the isolated pathogens were MRSA or ESBL/MBLs.
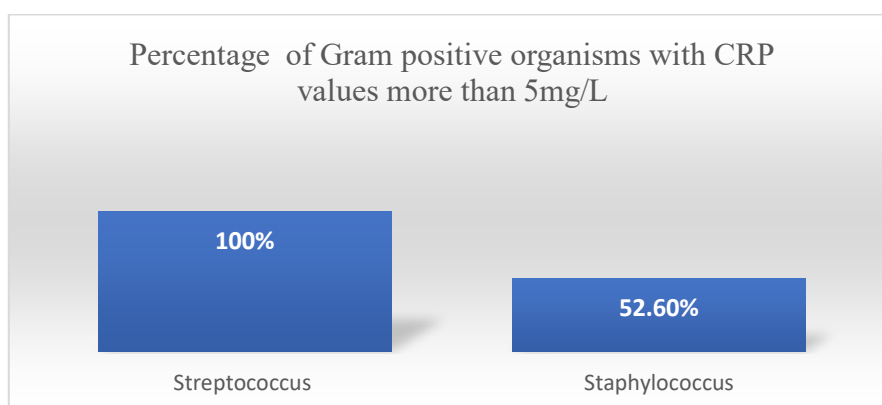

Among the pathogens 10 *Staphylococcus aureus* ,5 *E coli* , 3 *Klebsiella spp* ,1 *Pseudomonas spp* and 1 *Streptococcus* spp had CRP values more than 5mg/L and *Staphylococcus aureus* has high CRP value of 76.6mg/L, followed by *Pseudomonas spp* of 65.4, *E coli* of 61.5, *Klebsiella spp* of 43.3, *Streptococcus* 16.1mg/L.

Among Gram negative organisms 37.5% of *Klebsiella spp*, 35.7% of *E coli*, 33.3% of *Pseudomonas spp* had CRP values more than 5mg/L

Percentage of Gram negative organisms with CRP values more than 5mg/L

Klebsiella spp	E coli	Pseudomonas spp
37.50%	35.70%	33.30%

Among Gram positive organisms 100% 0f *Streptococcus spp* and 52.6% of *Staphylococcus aureus* had CRP values more than 5mg/L

Percentage of Gram positive organisms with CRP values more than 5mg/L

Streptococcus	Staphylococcus
100%	52.60%

DISCUSSION

In a study conducted by Nuutila J, Jalava-Karvinen P, Hohenthal U et al at Finland by using CRP/CD11b ratio to distinguish between Gram positive and Gram negative sepsis showed Gram positive bacterial infections had more CRP/CD11b ratio when compared with Gram negative infections indicating that Gram positive bacterial infections induces a significant increase in serum CRP levels when compared to Gram negative infections. This study is concordant with our study having Gram positive infections with high CRP values[4].

In a prospective study conducted by Povoa P, Coelho L, Almeida E et al from November 2001 to December 2002 included 76 infected patients and 36 non infected patients admitted in ICU showed the results that 76 infected patients had median CRP of 19.1mg/dl and 36 non infected patients had median CRP of 4mg/dl , a reasonable correlation was found between the severity of sepsis and CRP concentrations, indicating CRP as a good marker for diagnosis of sepsis[5].
Liang P, Yu F conducted retrospective study from October 2016 to May 2020 including 146 patients with bloodstream infection and sepsis admitted to intensive care unit (ICU) which showed CRP values significantly higher in the critically ill group than in the non-critically ill group and also revealed CRP has important clinical applications in the assessment of the extent of disease and prognosis of patients with bloodstream infection and sepsis[7].

CONCLUSION

This study provides baseline data on the correlation between blood pathogens and CRP values in sepsis patients. Gram-positive organisms are more in number and with high value of CRP when compared to Gram-negative organisms. Daily measurement of CRP is useful in the detection of sepsis as it is a good marker of sepsis

Incorporating CRP measurements into the initial evaluation of patients with suspected sepsis may assist physicians in determining an appropriate antibiotic treatment in patients with severe bacterial infection and also helps to identify those at greater risk of complications[6].

CRP may be a useful biomarker for diagnostic and prognostic purposes[8].

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